

REMARKS

The Amendments

No new matter has been introduced into this application by reason of the amendments presented herewith. New Claim 40 includes the features of original claims 1, 3 and 13. Claim 40 also specifies that the variation allowed for by the control system is for creating different yarns having different twist profiles. Written support for that feature can be found throughout the specification, in particular, at page 10, lines 18 to 22.

Claims 41, 49, 55, 61, and 67 are based on original Claims 7, 15, 20, 25, 30, and 35.

Claims 42 and 43; 50 and 51; 56 and 57; 62 and 63; and 68 and 69 are based on original Claims 8 and 9; 16 and 17; 21 and 22; and 36 and 37, respectively.

Claims 44 and 45; 52 and 53; 58 and 59; 64 and 65; and 70 and 71 are based on Claims 11 to 13 as originally filed. Claims 45, 53, 59, 65, and 71 also include the features of original Claims 12 and 13.

Claims 46, 47, 74, and 75 are directed to a method of using an apparatus according to the Applicant's invention and to a yarn when made by that method. Basis for these claims can be found throughout the specification as a whole.

Claim 48 is an amended version of original claim 2.

Claim 54 is an amended version of original claim 4.

Claim 60 is an amended version of original claim 5.

Claim 66 is an amended version of original claim 6.

Claims 72 and 73 are amended versions of original Claims 38 and 39. However, Claims 72 and 73 are dependent from each of Claims 48, 54, 60, and 64.

Objection to the Drawings

The Examiner objected to the Drawings because in Figure 7, the reference numeral "6d" was cut off and therefore, not legible. Figure 7 has been amended to correct this informality in the Drawings, as shown on the replacement drawing sheet attached to this response.

Objections to the Specification

The Examiner objected to the Specification because of the Abstract. The basis for the objection was not clearly expressed because the Examiner merely quoted all of the requirements for an abstract. However, the Examiner emphasized the text "on a separate sheet" in the quotation. Accordingly, the Applicant has inferred that the objection is directed to the fact that the Abstract presented in the published international application is not printed on a separate sheet.

This application is the US national stage (35 USC 371) of international patent application No. PCT/NZ2003/000253. Section 1893.03(e) of the MPEP includes the following statement.

The abstract is reproduced on the cover page of the publication, even though it appears on a separate sheet of the international application in accordance with PCT Rule 11.4(a). The requirement of 37 CFR 1.52(b) that the abstract "commence on a separate physical sheet or electronic page" does not apply to the copy of the published international application communicated to the designated Offices by the International Bureau under PCT Article 20. *Accordingly, it is improper for the examiner of the U.S. national stage application to require the applicant to provide an abstract commencing on a separate sheet if the abstract does not appear on a separate sheet in the publication of the international application.* Unless the abstract is properly amended under the U.S. rules during national stage processing, the abstract that appears on the cover page of the published international application will be the abstract published by the USPTO under 35 U.S.C. 122(b) and in any U.S. patent issuing from the application. (Emphasis added)

In view of the instruction of Section 1893.03(e), it appears that the Examiner's objection is improper and should be withdrawn.

The Examiner objected to the Specification because the text at page 5, line 24, of the application refers to "arrow A", but the arrow illustrated in Figure 2 is not identified. It is believed that the error is in the drawing figure, not in the descriptive text. Therefore, Figure 2 of

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the Drawings has been amended to include the reference letter "A" next to the arrow, as shown on the replacement drawing sheet attached to this response.

35 USC 102(b): Claims 1 to 6, 9, 14, 17, 19, 22, 24, 27, 29, 32, 34, 37, and 39

35 USC 103(a): Claims 7, 8, 15, 16, 25, 26, 30, 31, 35, and 36

The Examiner rejected Claims 1 to 6, 9, 14, 17, 19, 22, 24, 27, 29, 32, 34, 37, and 39 under 35 USC 102(b) as being unpatentable over US 3,443,370 (Walls). Claims 7, 8, 15, 16, 25, 26, 30, 31, 35, and 36 were rejected under 35 USC 103(a) as being unpatentable in view of Walls. Claims 1 to 39 have been cancelled. Therefore, those rejections are moot. However, new Claims 40-75 have been added. The Applicant's claimed apparatus and method as set forth in the new claims are novel relative to Walls for the following reasons.

Walls relates to a method of creating self-twisting yarns, which are yarns having areas of twist in an s-direction, areas of twist in a z-direction, and areas of non-twist in between. The non-twist areas in the yarns are weak points. The objective of Walls is to create a 4-ply self-twist yarn that is sufficiently strong to use for weaving. To achieve this objective, it is necessary to minimize the effect of the weak points, created by the areas of non-twist, on the overall strength of the yarn. This is achieved by, firstly, twisting four strands of wool by passing the strands through a first pair of reciprocating rotating rollers and allowing the strands to then self-twist together to form two self-twisted yarns. Then, secondly, imparting further twist on the two self-twisted yarns by using a second pair of reciprocating and rotating rollers and allowing the yarns to self-twist together to form a 4-ply yarn. A series of carefully positioned guides may be used between the first and second roller pairs in order to stagger the areas of twist in one strand/yarn relative to the other strand/yarn so that the resulting 4-ply yarn has minimal overlapping areas of non-twist. Thus, by staggering the strands relative to each other and by using two pairs of twist rollers to impart twist to areas of non-twist, the weakening effect of the non-twist regions on the yarn is greatly reduced.

Unlike the Applicant's claimed apparatus as set forth in independent Claims 40 and 48, the apparatus of Walls does not include twist rollers that are mounted in such a way that the extent of reciprocal movement of the rollers can be controlled and varied. See, for example,

column 3, lines 19 to 47, of Walls in which the configuration of the roller set up is described. In particular, Walls states, “the rollers are engaged by a pair of yokes 17, 18 in such a way that relative rotation between the roller and the yoke can occur, but *no relative translation is permitted.*” (Emphasis added.) Thus, the extent of reciprocal movement of the rollers in the Walls apparatus cannot be varied. To further exemplify this, the Applicant points out that the yokes are connected to wheels 21, 22 by chains, belts, pins, or the like. Therefore, to allow the extent of reciprocal movement of the rollers to be varied, it would be necessary to change the diameter of the wheels 21, 22 around which the belts, etc., travel.

Walls at column 5, lines 49 to 51, makes it clear that the extent of reciprocal movement of the second pair of rollers should be shorter than that of the first pair of rollers. However, this difference in stroke length is achieved when the machine is built by choosing a wheel 21, 22 of appropriate size. Once built, the extent of reciprocal movement of the rollers is fixed and cannot be changed without rebuilding the machine, as outlined above. Thus, unlike the Applicant’s claimed apparatus as set forth in Claim 40, the apparatus described in Walls is a fixed arrangement that does not allow the extent of reciprocal movement of the twist rollers to be controlled and varied between production runs to create yarns having different twist profiles.

Furthermore, the apparatus of Walls does not include a control system that allows for the speed of rotation and/or reciprocal movement of the twist rollers to be controlled and varied, another feature of the Applicant’s claimed apparatus as set forth in Claim 40. In fact, Walls teaches away from such a feature by specifying that the oscillation frequencies of the two rollers should be the same.

In addition, Walls does not teach or suggest the use of a non-reciprocating roller for pressing a core filament into one of the slivers before the slivers are twisted. Such a roller is a feature of the Applicant’s claimed apparatus as set forth in Claim 40.

The use of a control system for varying the rotational speed and reciprocation speed of the rollers and for varying the extent of reciprocal movement of the rollers is an important

feature of the Applicant's claimed apparatus. The use of a non-reciprocating roller to press a core filament into the slivers and provide strength to the yarn is also an important feature of the Applicant's claimed apparatus. This is because the Applicant's claimed apparatus is designed to provide a method and apparatus for producing yarns that have pre-determined twist profiles that are purposefully engineered to optimize the performance of the fabric in which the yarn will ultimately be used. Previously, this has not been possible in the art because the objective of many spinners in this field of technology, like the apparatus described in Walls, has generally been to find ways to improve the strength of the yarns by minimizing the effect of the areas of non-twist within the yarn. The present invention is not concerned with such an objective because the yarns produced by the apparatus and method of the present invention obtain sufficient strength from the core filament(s) used within the yarns.

Instead, as mentioned above, the Applicant's claimed apparatus is constructed and arranged for creating yarns that have predetermined twist profiles which, in turn, provide the yarns with specific properties, making the yarns suitable for the production of particular fabrics in which those properties are desirable. For example, a yarn to be used in a next-to-skin fabric would have a desired twist profile that minimizes the physical properties of bulk and prickle. Similarly, a yarn to be used in a terry-towelling sock would have a desired twist profile that maximizes the physical properties of bulk and absorption. See, for example, page 12, lines 9 to 12, of the present application.

Thus, the Applicant has discovered that by varying the key movement parameters of the twist rollers (those parameters being the speed of rotation and reciprocal movement, and the extent of reciprocal movement), it is possible to create yarns having different twist profiles and fiber structures. Furthermore, by understanding the effects of varying these key parameters on the twist profiles of the yarns, the Applicant has discovered that it is possible to create a yarn having a predetermined twist profile and, therefore, predetermined properties, by setting the key parameters of the twist rollers in a particular way.

In short, the yarns produced by the Applicant's claimed apparatus can be engineered to optimize the desired performance characteristics of the fabrics or products produced from the yarns. For example, by creating different twist profiles in the yarn, it is possible to alter the exposed surface of the component fibers of the yarn to optimize specific physical properties of the yarn, such as the ability of the yarn to absorb moisture; the reduction of prickle caused by the projecting ends of exposed fibers; and/or reduced fiber shedding and/or pilling. See for example, page 12, lines 12 to 24, of the present application.

Furthermore, the Applicant has discovered that if a core filament is used in the yarn, then it is not necessary to impart a certain level of twist to the yarns to obtain the required strength, unlike the prior art methods and apparatus. Thus, without having to twist for strength, many more different yarns with different twist profiles and physical properties can be created. For example, a multi-ply yarn for use in producing a high quality light weight knit fabric of wool may be produced using a twist profile with relatively long areas of twist in the individual strands, in which the degree of twist is low, and shorter areas of non-twist. See, for example, page 12, lines 24 to 32, of the present application. Alternatively, yarn with a core filament can be used to produce terry towelling fabrics by creating a yarn with a twist profile in which the strands have short areas of medium twist between longer areas of non-twist. See for example, page 12, line 6, through to page 13, line 10, of the present application. See also the experimental results described in the specification from pages 13 to 20.

In view of the foregoing comments, it should now be clear that the Applicant's claimed apparatus is directed to an entirely different objective than the apparatus described in Walls.

In summary, it is submitted that Walls does not teach or suggest an apparatus for creating a self-twisting yarn in which: a) the extent of reciprocal movement of the twist rollers can be controlled and varied; b) a non-reciprocating roller is used to press a core filament into slivers of fibre before twisting; and c) a control system can be used to control and vary the speed of rotational and/or reciprocal movement of the twist rollers to vary the twist profiles imparted to

the yarn. Therefore, the Applicant's claimed apparatus as set forth in Claims 40 and 48 is novel relative to Walls.

Claims 41 to 47 depend from Claim 40 either directly or indirectly, and thus, include all of the features of Claim 40. Therefore, Claims 41 to 47 are novel relative to Walls for at least the same reasons as Claim 40.

Claims 49 to 75 depend from Claim 48 either directly or indirectly, and thus, include all of the features of Claim 48. Therefore, Claims 49 to 75 are novel relative to Walls for at least the same reasons as Claim 48.

35 USC 103(a): Claims 13, 18, 23, 28, 33, and 38

The Examiner rejected Claims 13, 18, 23, 28, 33, and 38 under 35 USC 103(a) as being unpatentable over Walls in view of US 6,655,122 (Shigeyama et al.). The rejected claims have been cancelled, thereby rendering this rejection moot. However, the Applicant believes that the new claims are allowable over the proposed combination of Walls and Shigeyama et al. for the following reasons.

Shigeyama et al. describes an apparatus directed to an entirely different manner of manufacturing yarn. In particular, the apparatus described and shown in Shigeyama et al. includes a drafting unit where strands of wool are thinned out in a known manner and a spinning unit in which a core filament and the drafted strands are guided into a yarn passage in which the strands are whirled around the core filament using airflow. This is a very different apparatus for producing yarn than the Applicant's claimed apparatus as set forth in Claims 40 and 48. Moreover, the Shigeyama et al. apparatus produces yarn by a process that is different from the Applicant's claimed process because Shigeyama et al. is not concerned with self-twisting yarns. The apparatus described in Shigeyama et al. also includes a control device for stopping the drafting rollers and the valves for supplying air pressure to spin the yarn if, for some reason, the production run needs to be stopped.

Shigeyama et al. does not teach or suggest an apparatus for producing a self-twisting yarn by using reciprocating rollers to twist the strands around each other. Nor does the document teach or suggest the use of a non-reciprocating roller for pressing a core filament into the slivers before the slivers are passed through twisting rollers. In addition, Shigeyama et al. does not teach or suggest a control system for controlling variation of the rotational speed of the twist rollers; the speed of the twist rollers along the axis of rotation; or the extent of movement of the twist rollers along the axis of rotation, all of which are features of the Applicant's claimed apparatus.

For the foregoing reasons, it is believed that new Claims 40-75 are novel and inventive relative to Shigeyama et al. whether considered alone or in combination with Walls.

CONCLUSION

In view of the foregoing amendments and remarks, it is believed that this application is in condition for allowance. The Applicant respectfully requests that the Examiner reconsider the rejection of this application.

Respectfully submitted,

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Attachments: Drawing replacement sheets (2)